(No Model.)

T. A. EDISON & E. T. GILLILAND.

RAILWAY SIGNALING.

No. 384,830. Patented June 19, 1888.

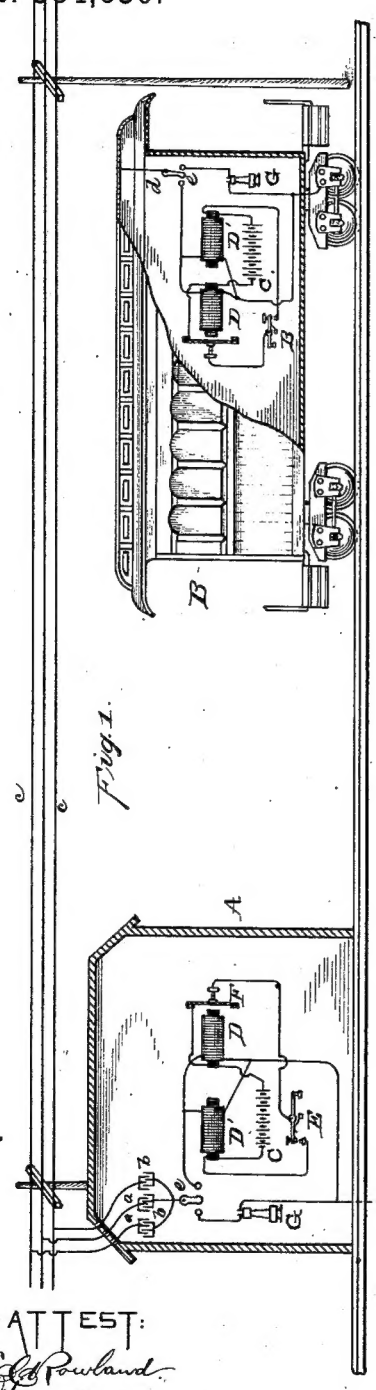

Fig. 1.

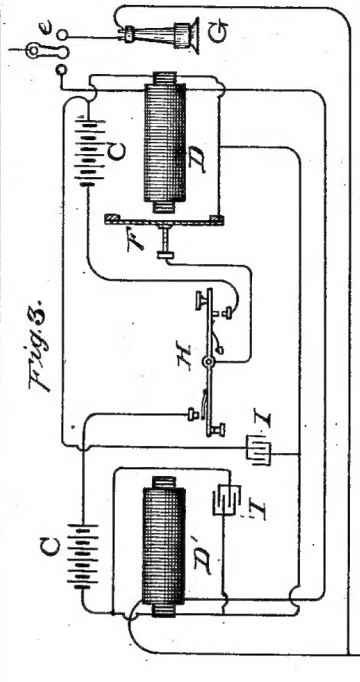

Fig. 3.

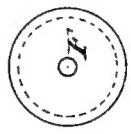

Fig. 4.

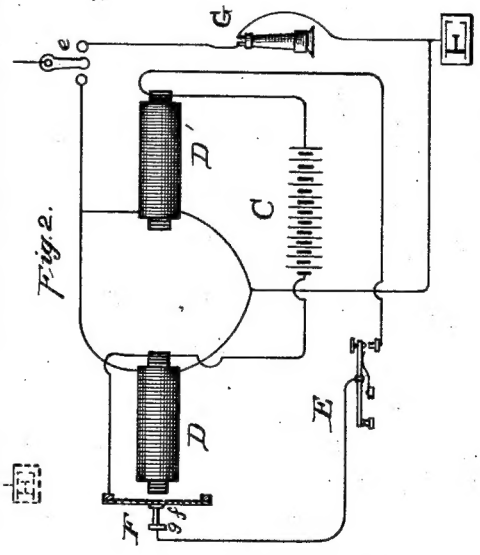

Fig. 2.

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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY, AND EZRA T. GILLILAND, OF NEW YORK, N. Y.

RAILWAY SIGNALING.

SPECIFICATION forming part of Letters Patent No. 384,830, dated June 19, 1888.

Application filed November 29, 1886. Serial No. 220,115. (No model.)

To all whom it may concern:

Be it known that we, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, and EZRA T. GILLILAND, of the city, county, and State of New York, have invented a certain new and useful Improvement in Systems of Railway Signaling, (Case No. 684,) of which the following is a specification.

Our invention relates to signaling systems for communicating between stations and moving trains by induction from the telegraph-wires to the roofs of the cars. In such a system we prefer to employ as transmitters vibrators operated by keys, by which signals are sent upon the line, and as receivers telephone-receivers connected to ground. In the operation of such a system it is desirable to make the transmitted vibrations as short and distinct as possible in order that they may be clearly reproduced at the receiver.

The object of our invention is to increase the quickness, rapidity, and clearness of the vibrations, and we accomplish this by means of novel devices and combinations of devices which constitute our invention and are hereinafter described and claimed.

In the accompanying drawings, Figures 1 illustrates a railway signaling system embodying our invention, the circuits and instruments in the car and station being shown diagrammatically. Fig. 2 is a larger diagram of the preferred arrangement of circuits for either a car or station; Fig. 3, a similar diagram of a modified arrangement of circuits, and Fig. 4 a view of the vibrator which we prefer to use.

One feature of our invention is the dividing of the transmitting induction-coil—that is, using two or more small coils instead of one large one. Heretofore we have placed in each station or car a single induction-coil having in its primary circuit a key and a vibrator, while its secondary circuit was connected in one direction with the earth, and in the other, at the station, through condensers to the telegraph-wires, and on the car with the metal roof thereof. By our present invention we employ two or more induction-coils, preferably having their primary coils in series and their secondary coils in multiple arc, though they may be otherwise connected, as will be presently explained.

Referring to the drawings, A represents a station, and B a car, each provided with signal transmitting and receiving apparatus embodying our invention. In the station such apparatus is connected by wires *a a*, through condensers *b b*, with the ordinary telegraph-wires, *c c*, which extend along the track. In the car the apparatus is connected by wire *d* with the metal roof of the car or with metal strips placed thereon. Each signaling apparatus is provided with a switch, *e*, by which either the receiving or transmitting apparatus is connected in circuit.

As is now well understood, the vibrations communicated to the telegraph-wires by the transmitter at the station are transmitted by induction to the roof of the car and to the receiving apparatus therein, while the vibrations transmitted from the car induce vibrations upon the telegraph-wires which are received at the station.

The apparatus in Fig. 2 is that either of a car or a station. C is the transmitting-battery. D D′ are induction-coils, having their primary coils connected in series with each other and in circuit with the battery C. The same circuit includes a circuit making and breaking key, E, and also a vibrator.

The use of the form of vibrator shown constitutes another feature of our invention in pursuance of the general object of increasing the rapidity and distinctness of the vibrations. It consists of a diaphragm, F, like a telephone-diaphragm, and preferably of metal, secured rigidly at its edges, and having at its center, which is immediately in front of the core of the induction-coil D, a contact-piece, *f*, which makes and breaks circuit as the diaphragm is moved by the attraction of said core with a stationary contact-point, *g*. The secondaries of the induction-coils are connected in multiple arc, as shown, between switch *e* and the earth, the ground-connection being made in the car by a connection with the wheels thereof.

The receiving apparatus is a telephone-receiver, G, in circuit between switch *e* and ground.

When the key E is depressed, the diaphragm

vibrator F is at once set in operation, and by rapidly opening and closing the primary circuits of the two induction-coils induces corresponding vibrations in the two secondaries, which are transmitted to the receivers in circuit, as already explained.

The movements of the key break the vibrations into Morse signals, as now well understood.

Diaphragms used as vibrators give more rapid, clear, and distinct vibrations than have heretofore been produced by the use of reeds or pivoted or other vibrators. The division of the induction-coils has a similar effect, since the smaller induction-coils act with much greater rapidity than large ones.

In Fig. 3 a different arrangement of circuits is shown. Here the battery is divided into two parts in multiple arc to each other, and each in series with the primary of one of the inductions, which also are in multiple arc to each other. The vibrator is common to both primary circuits, and a double key, H, is employed, which affects the two primary circuits alike and simultaneously.

Each induction-coil primary is shunted by a condenser, I, which we find also serves to increase the clearness of the vibrations.

What we claim is—

1. In transmitting apparatus for induction railway signaling, the combination, with two or more induction-coils having their secondary circuits connected to line, of a battery, a key, and a vibrator, all located in the primary circuits of the two or more induction-coils, substantially as set forth.

2. In transmitting apparatus for induction railway signaling, the combination, with an induction-coil having its secondary circuit connected to line, of a battery, a key in the primary circuit of such induction-coil, and a diaphragm-vibrator also located in such primary circuit, the diaphragm being located near the end of the core of the induction-coil and being attracted thereby, substantially as set forth.

3. In transmitting apparatus for induction railway signaling, the combination, with two or more induction-coils having their secondary circuits connected to line, of a battery, and a key in the primary circuits of such induction-coils, and a diaphragm-vibrator also located in the primary circuits of both coils, the diaphragm being located opposite the core of one coil and being attracted thereby, substantially as set forth.

4. In transmitting apparatus for induction railway signaling, the combination, with the transmitting battery and key, of a diaphragm-vibrator in circuit therewith, substantially as set forth.

This specification signed and witnessed this 24th day of November, 1886.

THOS. A. EDISON.
EZRA T. GILLILAND.

Witnesses:
WM. PELZER,
E. C. ROWLAND.